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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/732,819

12/11/2003

Kwang-youn Seo

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5885

21171

7590

12/23/2005

STAAS & HALSEY LLP

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EXAMINER

BEHM, HARRY RAYMOND

ART UNIT

PAPER NUMBER

2838

DATE MAILED: 12/23/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/732,819

Applicant(s)

SEO, KWANG-YOUN

Examiner

Harry Behm

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 11 December 2003.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-23 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1,2,4-9,11-14 and 16-20 is/are rejected.
- 7) ☒ Claim(s) 3,10,15 and 21-23 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 11 December 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
- 1) ☒ Certified copies of the priority documents have been received.
 - 2) ☐ Certified copies of the priority documents have been received in Application No. _____.
 - 3) ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date <u>12/11/03 11/23/04</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Specification

1. The title of the invention is not descriptive. A new title is required that is clearly indicative of the invention to which the claims are directed.
2. The following title is suggested: DC/DC converter with input and output current sensing and over current protection capable of interrupting the input power supply.

Claim Objections

3. Claim 21 is objected to under 37 CFR 1.75(c), as being of improper dependent form for failing to further limit the subject matter of a previous claim. Applicant is required to cancel the claim(s), or amend the claim(s) to place the claim(s) in proper dependent form, or rewrite the claim(s) in independent form. The structure of a switching supply is already claimed in 13 by the DC/DC converter supplying a plurality of phase currents.
4. Claim 22 is objected to under 37 CFR 1.75(c), as being of improper dependent form for failing to further limit the subject matter of a previous claim. Applicant is required to cancel the claim(s), or amend the claim(s) to place the claim(s) in proper dependent form, or rewrite the claim(s) in independent form. The structure of a comparator outputting a control signal is already claimed in the final paragraph of Claim 13.
5. Claim 23 is objected to under 37 CFR 1.75(c), as being of improper dependent form for failing to further limit the subject matter of a previous

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claim. Applicant is required to cancel the claim(s), or amend the claim(s) to place the claim(s) in proper dependent form, or rewrite the claim(s) in independent form. Incorporating a microcontroller to the control signal provides a pass through functionality or additional filtering but does not add new structure.

Claim Rejections - 35 USC § 112

6. The following is a quotation of the second paragraph of 35 U.S.C.

112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

7. Claim 20 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Claim 20 states functionality the applicant desires from the unit, instead of detailing additional structure.

Claim Rejections - 35 USC § 103

8. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

- a. A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

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9. Claims 1, 2, 4-9, 11-14 and 16-19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Liu (6,414,470) in view of Furuhashi (5,227,964).
10. With respect to Claim 1, Liu teaches a DC/DC converter (Fig. 1 #10) having a plurality of phase processing units (Fig. 1 #14) separating the DC power supplied from the power supplying unit into a plurality of phase currents (Fig. 1 I) to process (Fig. 1 #18) the plurality of phase currents, with which the DC/DC converter converts the DC power into individual power supplies (Fig. 1 #16) in a plurality of different voltages needed for each component (Fig. 1 #12) of a computer system. Liu does not show the power supplying unit supplying DC power. Furuhashi teaches a power supplying unit (Fig. 1) supplying DC power (Fig. 1 V_2) with an overcurrent protective circuit (Fig. 1 #12) to interrupt (Fig. 1 #12S) the DC power supply where a voltage (Fig. 1 #11 detected voltage) corresponding to the current is higher than a predetermined reference voltage (Fig. 1 #12 normal value). It would have been obvious to one of ordinary skill in the art at the time of invention to connect the input of the DC/DC converter of Liu to the output of the switching supply of Furuhashi in order to obtain a more accurate output voltage (Liu Fig. 1 #16) at a desired voltage level. Furthermore, it would have been obvious to one of ordinary skill in the art at the time of the invention to take the controller (Liu Fig. 1 #10) sensing the phase currents (Liu Fig. 1 I) of each of the phase processing units of the DC/DC converter of Liu and utilize them for controlling the power

supplying unit (Furuhata Fig. 1) so as to interrupt (Furuhata Fig. 1 #12S) the DC power supply from the power supplying unit of Furuhata where a voltage (Liu Fig. 11 #781) corresponding to any one of the phase currents (Liu Fig. 1 I) is higher than a predetermined reference voltage (Furuhata Fig. 1 #12 normal value), for the purpose of making the system safer by reducing the possibility of damage to load equipment by interrupting the DC power supply when an overcurrent condition is detected in the phase current.

11. With respect to Claim 2, Liu in view of Furuhata teaches the power supply system according to claim 1, further comprising a reference voltage supplying unit (Furuhata Fig. 1 #12) supplying the predetermined reference voltage (Furuhata Fig. 1 #12 normal value).
12. With respect to Claims 5-8, 12 and 17, Liu in view of Furuhata teaches the power supply system as set forth above, wherein the predetermined reference voltage (Furuhata Fig. 1 #12 normal value) corresponds to an overcurrent condition, which in the case of current sensing of the phase currents for interrupting the DC power supply as above, corresponds to a maximum coincident current of the phase processing units.
13. With respect to Claim 9, Liu teaches a DC/DC converter (Fig. 1 #10) having a plurality of phase processing units (Fig. 1 #14) separating the DC power supplied from the power supplying unit into a plurality of phase currents (Fig. 1 I) to process the plurality of phase currents, with

which the DC/DC converter converts the DC power into individual power supplies in a plurality of different voltages (Fig. 1 #16) needed for each component of a computer system, and sensing the phase current of each of the phase processing units (Fig. 1 #203), and comparing a voltage (Fig. 11 # 781) corresponding to the sensed phase current of each of the phase. Liu does not show the power supplying unit supplying DC power. Furuata teaches a power supplying unit (Fig. 1) so as to interrupt (Fig. 1 #12S) a power supply from the power supplying unit. Furthermore, it would have been obvious to one of ordinary skill in the art at the time of the invention to compare the voltage corresponding to any one of the phase currents (Liu Fig. 1 I) to the predetermined reference voltage (Furuata Fig. 1 #12 normal value), for the purpose of making the system safer by reducing the possibility of damage to load equipment by interrupting the DC power supply when an overcurrent condition was detected in the phase current.

14. With respect to Claims 11, Liu in view of Furuata teaches the power supply system as set forth above, wherein the predetermined reference voltage (Furuata Fig. 1 #12 normal value) corresponds to an overcurrent condition, which in the case of current sensing of the phase currents for interrupting the DC power supply as above, corresponds to a maximum coincident current of the phase processing units.
15. With respect to Claim 13, Liu discloses: a DC/DC converter (Fig. 1 #10) being supplied with DC power by the DC power supply and

comprising a plurality of phase processing units (Fig. 1 #14) to supply, respectively, a plurality of phase currents (Fig. 1 I) such that the plurality of phase processing units convert the DC power into a plurality of different voltages ((Fig. 1 #16). Liu does not show the power supplying unit supplying DC power. Furuata teaches a controller sensing a voltage (Fig. 1 #12 detected voltage from a current detection resistor) and interrupting (Fig. 1 #12S) the DC power supply (Fig. 1) when the sensed voltage is higher than a predetermined reference voltage (Fig. 1 #12 normal value). Furthermore, it would have been obvious to one of ordinary skill in the art at the time of the invention to take the controller (Liu Fig. 1 #10) sensing a voltage corresponding to the phase currents (Liu Fig. 1 I) of each of the phase processing units (Liu Fig. 1 #201) and interrupting (Fig. 1 #12S) the DC power supply when the sensed voltage (Liu Fig. 11 #781) corresponding to any one of the phase currents is higher than a predetermined reference voltage (Furuata Fig. 1 #12 normal value), for the purpose of making the system safer by reducing the possibility of damage to load equipment by interrupting the DC power supply when an overcurrent condition is detected in the phase current.

16. With respect to Claim 14, Liu in view of Furuata teaches the power supply system according to claim 13, further comprising a reference voltage supplying unit (Furuata Fig. 1 #12) supplying the predetermined reference voltage (Furuata Fig. 1 #12 normal value).

17. With respect to Claims 4 and 16, Liu in view of Furuhashi teaches the power supply system set forth above, wherein a transistor (Fig. 11 #78), which inherently has a resistance between its source terminal and a drain terminal (Fig. 11 #781), senses the voltage (Fig. 11 VCS1) corresponding to the phase current (Fig. 1 I1) of respective ones of the phase processing units. Liu teaches signal VCS1 can be derived directly from the drain of the low-side transistor to sense the channel current I1. Since the proposed sense resistor R_{ds_on} (See Fig. 3) must be large to limit steady state leakage current from VCS1, it is actually the much lower resistance of the transistor that would dominate the resistance from the drain to source of the FET, and whose corresponding voltage drop will thereby be sensed.
18. With respect to Claim 18, Liu in view of Furuhashi teaches the power supply system according to claim 17, and by Kirchhoff's Current Law the maximum coincident current of the phase processing units is a sum of the maximum phase currents from each of the phase processing units.
19. With respect to Claim 19, Liu in view of Furuhashi teaches the power supply system according to claim 13, wherein the controller comprises a pulse width modulation controller (Liu Fig. 1 #18) generating a pulse width modulation signal (Fig. 1 PWM), and each of the phase processing units (Fig. 1 #14) comprise switching elements such that a turn-on/ turn-off period of the switching elements are controlled by the pulse width

modulation controller to reduce the voltage (Fig. 16) supplied by each of the phase processing units.

Allowable Subject Matter

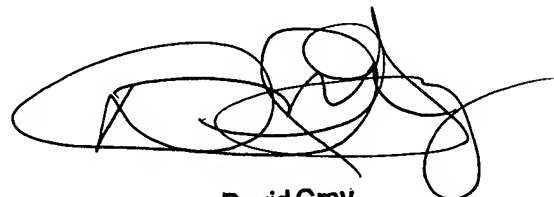
20. Claim 3, 10 and 15 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.
21. The following is a statement of reasons for the indication of allowable subject matter: the prior art shows an inductor disposed on a power line between the power supplying unit and the phase processing units, and an amplifier amplifying a voltage induced across first and second terminals of the inductor at a predetermined rate but the prior art does not suggest the use of the voltage across the inductor as the reference voltage.

Conclusion

22. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Goder (6,127,814) teaches using the resistance of an inductor as a sense resistor. Hwang (6,737,845) teaches using a current limiting resistor which may be switched in and out by a FET.

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23. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Harry Behm whose telephone number is 571-272-8929. The examiner can normally be reached on Business EST.
24. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David Gray can be reached on 571-272-2119. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.
25. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

A handwritten signature in black ink, appearing to read 'David Gray', with a large, stylized flourish extending to the right.

David Gray
Primary Examiner